ON THE AMERICAN REPRESENTATIVES OF SOMATOCHLORA ARCTICA WITH DESCRIPTIONS OF TWO NEW SPECIES. (ODONATA).

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Three North American species of Somatochlora have been described in which the appendages of the male are of the same general form as in the palæarctic species *S. arctica* Zetterst. These are *S. forcipata* Scudd., *S. semicircularis* Selys, and *S. franklini* Selys. Another species, *S. macrotona*, has been described by Williamson (Ent. News, XX, 1909, pp. 78–79) but, as mentioned below, I find this to be identical with *franklini*. To these three species I have two others to add, so that we have in North America five species of the *arctica* group. I had intended that the descriptions of these new species should first appear in a monograph of the American species of this genus, which is now in course of preparation, but at the request of another writer who wishes to list one of them I decided to publish them in advance.

The five North American species of Somatochlora of the *arctica* group may be separated as follows:

A. Superior appendages of ♂ with a prominent external tubercle beyond the middle, visible from above; vulvar lamina half as long as 9th sternite, bilobed; postclypeus wholly black.....*semicircularis* Selys.

AA. Distal external tubercle of superior appendages when present not or scarcely visible from above; vulvar lamina little or no shorter than the 9th sternite, entire; postclypeus variable.

B. Abdominal segments 5 to 7 with yellow latero-basal spots, greatest width of ♂ abdomen distal end of seg. 5, thence narrowing caudad.

C. Lateral thoracic spots brownish, scarcely paler than the ground colour, the mesepimeral elongate, ill defined; superior appendages of ♂ in profile straight, ventro-lateral tooth not affecting the outline; vulvar lamina extending almost or quite to the hind margin of 10th sternite.....*incurvate* n. sp.

CC. Lateral thoracic spots pale yellow, subovate, conspicuous; superior appendages of ♂ in profile arcuate, with a very prominent ventrolateral tooth, which affects the outline; vulvar lamina about as long as 9th sternite.....*forcipata* Scudd.

BB. Abdominal segments 5 to 7 without yellow spots, greatest width of ♂ abdomen at distal end of seg. 6 or beyond.

D. Frons bounded below by a yellowish margin, separating the metallic portion from postclypeus, the latter with yellowish lateral lobes; hind wing of ♂ but little shorter than abdomen (about 30:33), the anal triangle more or less yellow.....*kennedyi*, n. sp.

DD. Frons without a yellow inferior margin, the dark coloration continuous with that of postclypeus, which is wholly black; hind wing of ♂ decidedly shorter than abdomen (about 26:38), anal triangle with a brown spot.....*franklini* Selys.

Somatochlora semicircularis Selys.

This species seems to be wholly western, and is apparently the commonest species of the genus from the Rocky Mountains to the Pacific Coast. References to *semicircularis* from eastern localities (Williamson, Ent. News, April, 1906, p. 136, pl. V, figs. 2, 3, 4) apply to *S. kennedyi*.

S. semicircularis is easily recognized by the form of the male abdominal appendages and the vulvar lamina of the female, together with the black lateral lobes of the clypeus. The lateral thoracic spots are conspicuous in young individuals but of a deeper yellow than in *forcipata*, and the metepimeral spot is usually much smaller. Lateral abdominal spots are generally present but are variable and sometimes absent. The extent of these variations are well shown by Kennedy (Proc. U. S. Nat. Mus., 46, 1913, pp. 111–126, figs. 1–57). It is the stoutest of the five species of the group.

Material studied.—68 ♂'s, 21 ♀'s; Banff, Alta., June 29–31, 1913, 5 ♂'s 2 ♀'s, (Walker and Kurata); Nordegg, Alta., 6,500 ft., July 16, 1917, 1 ♂, (F. C. Whitehouse); Mt. Benson, Vancouver Is., B.C., July 21, 1909, 4 ♂'s 1 ♀; id., July 23, 1909, 1 ♀, (A. G. Huntsman); Departure Bay, Vanc. Is., July 13, 1908,

4 ♂'s 2 ♀'s, (Huntsman); near Lonely Lake, Vanc. Is., July 19, 1913, 6 ♂'s 2 ♀'s, (Walker and Kurata); Ainsworth, B.C., July 11, 1903, 1 ♂, (R. P. Currie, U.S.N.M.); Bumping Lake, Wash., July 10–11, 1911, 37 ♂'s 12 ♀'s, incl. 7 prs. in cop. (C. H. Kennedy, U.S.N.M.); Big Meadows, Or., July 7–8, 1913, 6 ♂'s, (Kennedy); Snake River, Yellowstone National Park, Aug. 14, 1896, 1 ♂, (Currie, U.S.N.M.); "Mountains, S. W. Colorado," Aug. 15–Sept. 6, 3 ♂'s 1 ♀ (Lieut. Carpenter, coll. Calvert, 1 ♂ coll. Walker).

Somatochlora incurvata, n. sp.

Male.—Occiput, frontal vesicle and upper part of frons metallic blue-black; sides of frons and lower margin ochreous to brownish yellow; postclypeus black in middle, lateral lobes castaneous; labrum black; anteclypeus and labium pale yellow; pile moderately dense, blackish on metallic areas, elsewhere pale brownish.

Prothorax dark greyish-brown, anterior lobe broadly edged with whitish, posterior lobe brownish ochreous. Meso- and metathorax metallic blue to violet, sometimes with greenish reflexions, with the following parts reddish brown; antealar sinus, inferior half of mesepisternum, an area along bases of wings extending as a stripe down the mesepimerum, an obscure, ill-defined area enclosing the metastigma and a large spot on the metepisternum, which is angular above when well defined. The mesepimeral and metepimeral spots are generally lighter than the other brown areas. Fore coxæ black in front, reddish brown behind, this colour extending over most of the outer surface of the fore femora. Pile of thorax rather thin, especially on the sides, pale brown.

Wings hyaline, the faint yellow tinge deepening in the anal triangles; pterostigmata castaneous, not very dark; costal veins dark brown, edged with dull ochreous toward the base; membranule dull dark brown, paler in basal third.

Abdomen slender, elongate, expanding from the constriction at seg. 3 to the distal end of seg. 5, narrowing gradually on 6, more rapidly on 7 and 8. Pile pale brownish, scanty. Genital lobes rather small, rounded angulate, incurved.

Colour greenish black, moderately shining. Segments 1, 2 and base of 3 castaneous, somewhat lighter on the sides and dorsal

surface of 2, but not forming distinct spots in the specimens studied. Base of 3 with lateral yellowish patch extending from dorsal to ventral surface. Segs. 4 to 8, each with a roundish, baso-lateral spot becoming small on 8.

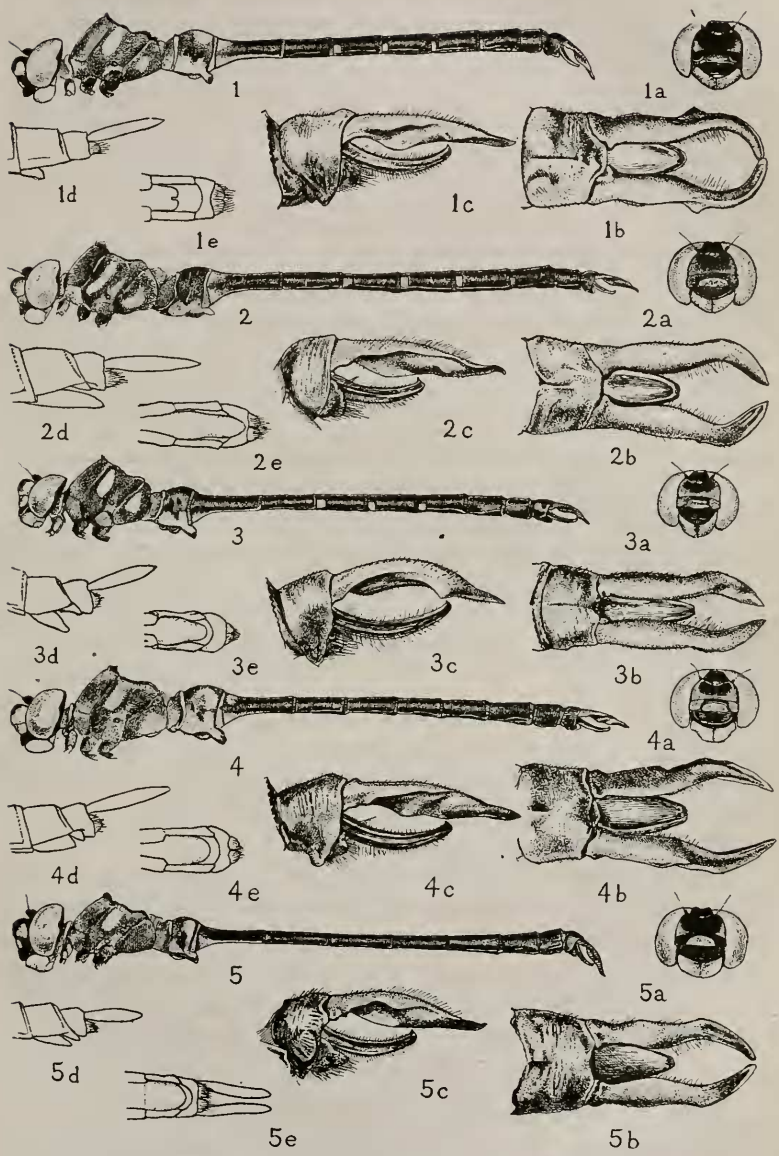
Appendages.—The form of these is shown on pl. X, figs. 2b, 2c. In dorsal view the superior appendages appear widest at the base, where they are close together, subparallel in proximal half, the apical inward curve nearly as in *semicircularis* but not quite so regularly arcuate. In profile they are straight, lateral carinæ percurrent, inferior carinæ gently arcuate towards base, slightly bent outward, but not visible from above; ventro-lateral prominence well marked, barely seen from above (probably not in all cases); apices acute, slightly carinate above, the extreme tips somewhat decurved (perhaps in drying). Inferior appendage about half as long as superiors, triangular, apex bluntly pointed, with a well-marked recurved spine.

Female.—Similar in coloration to male. Seg. 2 is entirely castaneous, except a very small lateral spot and an apical ring, which are pale brownish grey or drab. The underside of 3 is also of about the same colour. The yellow spots on the other abdominal segments are usually larger than in the ♂, and often diffusely prolonged caudad.

The wings as usual show considerable variation in colour but are typically hyaline, each with two basal, amber, yellow streaks, and a yellowish cloud occupying the distal half, or less, of the wing and deepest about the pterostigma. In some individuals the entire wing is flavescent, but even in these the basal streaks appear deeper than the rest of the wing.

In most of the specimens the abdomen is broadest at base and tapers fairly regularly to near the caudal extremity, but, as in other species, its form varies with age, younger individuals being more depressed and regularly tapering, older ones more cylindrical and laterally constricted at seg. 3.

The vulvar lamina is elongate, extending in all the specimens well beyond the distal margin of the 9th sternite, as far as that of 10 or even a little farther. It is horizontal, trough-shaped, the sides slightly convergent, apex broadly rounded, upper edges before the apical curve slightly arcuate. Inferior surface in profile



NORTH AMERICAN SPECIES OF SOMATOCHLORA OF THE *ARCTICA* GROUP.

feebly convex. Colour yellowish, darkened in the middle. Appendages about as long as vulvar lamina or as segs. 9 and 10 together.

VENATIONAL DETAILS. (2 ♂'s 10 ♀'s.)

	No. of veins	No. of wings, ♂	No. of wings, ♀		No. of veins	No. of wings ♂	No. of wings ♀
Antecubitals fore wings	7 8 9	 2 2	3 = 15% 16 = 80% 1 = 5%	2nd postc. before pter., fore wings	3 4	4 4	17 = 85% 3 = 15%
Antecubitals hind wings	5 6	2 2	18 = 90% 2 = 10%	2nd postc. before pter., hind wings	3 4 5	 4	4 = 20% 14 = 70 2 = 10%
Postcubitals fore wings	5 6 7	 4	6 = 30% 10 = 50% 4 = 20%	Veins in triangle, fore wings	0 1	 4	2 = 10% 18 = 90%
Postcubitals hind wings	6 7 8 10	 1 3	2 = 10% 12 = 60% 5 = 25% 1 = 5%	Veins in triangle, hind wings	0 1	 4	2 = 10% 18 = 90%

*Measurements**.—(2 ♂'s, 10 ♀'s)—Length (without apps.) ♂ 52.0–54.5, ♀ 47.5–56.5; thorax, ♂ 8–9, ♀ 7.5–8.5; abdomen (without apps.), ♂ 38.0–39.5, ♀ 35.0–43.0; hind wing, ♂ 33.0–34.0, ♀ 32.0–36.5 ; sup. apps. ♂ 4 ; apps. ♀ 3.0–3.75; pterostigma of hind wing (costal margin), ♂ 2.75–3.0, ♀ 2.8–3.5; width of hind wing, ♂ 9.25–10.0, ♀ 9.0–10.3; width of head, ♂ 7.6–8.0, ♀ 7.0–8.0.

Holotype.—♂ Whitefish Pt., Chippewa Co., Mich., July 29, 1916 (A. F. Combs). *Allotype.*—♀, same data. Both in the University of Michigan Museum, Ann Arbor, Mich. *Paratopotypes.*—1 ♂ 2 ♀'s Aug. 7, 1916; 6 ♀'s July 29, 1916; 1 ♀ Aug. 4, 1916, 1 ♀ without date. Total 2 ♂'s 11 ♀'s.

This species is a very close relative of *S. forcipata.* Its average size is larger and the lateral thoracic spots differ in shape and colour, otherwise the colour pattern approaches that of *forcipata* closely. The superior appendages of the ♂ appear in profile more like those of *kennedyi* than *forcipata* and, as in the former the inferior appendage is only about half the length of the superiors. The vulvar lamina is decidedly longer than in any other species.

Somatochlora forcipata Scudder.

This slender, dark-coloured species is rather widely distributed but seems to be everywhere rare. It ranges from New-

*All measurements are in millimetres.

foundland and Labrador to Great Slave Lake and southward to Nova Scotia, northern New England, Quebec, Ontario and northern Michigan. I have seen but nine specimens from the following localities:

Hopedale, Labrador, Aug., 1917, 1 ♂, (W. W. Perrett) Ashwanipi River, Northern Quebec, July 25, 1917, 1 ♀, (Carnegie Museum Coll.); Isle d'Orleans, Que., Aug. 27, 1904, 1 ♂, (Walker); Algonquin Park, Ont., July 15, 1900, 1 ♂, (J. Macoun); De Grassi Pt., Ont., June 26, 1918, 1 ♂, (Walker); Profile Lake, N. H., July 20, 1918, 1 ♂, (R. H. Howe); Manistiqua River, Schoolcraft Co., Mich., 2 ♂'s, (A. F. Combs); Marquette, Mich., 1 ♀, (Coll. Hubbard & Schwarz, U. S. N. M.).

Somatochlora kennedyi, n. sp.

Male.—Occiput, frontal vesicle and upper part of frons metallic blue-black or green-black; sides of frons and a moderately broad, lower margin yellowish brown; postclypeus dark brown or black in centre, lateral lobes yellow; labrum black or deep brown, anteclypeus and labium pale yellow. Pile somewhat dense, blackish on top of head, pale yellowish on face. Rear of head black with whitish pile.

Prothorax greyish brown, anterior lobe edged with whitish, posterior lobe testaceous. Meso- and metathorax metallic gold-green with blue reflexions, the actual brilliancy of the colour much obscured by dense, light brownish pile; the following parts ochreous but not forming well-defined nor conspicuous spots:—the antealar sinus, the ventral edges of the mesepisternum, a narrow area below bases of wings, an oblong or ovate spot on the mesepimerum connected with the above area, an ill-defined blotch enclosing the metastigma, and the posterior half or more of the metepimerum. Fore coxæ black in front, dull yellowish above and behind, this colour extending over trochanters to outer surface of fore femora in their basal half.

Wings hyaline or tinged with yellow, especially along costa, sometimes entirely suffused with amber yellow; costa yellowish proximally, darkening beyond nodus; pterostigmata dark yellowish brown; hind wings with a yellow basal spot of variable size and

depth of colour, but not extending much beyond the anal triangle; membranule dark smoky brown, the basal third or fourth paler.

Abdomen greatly constricted at seg. 3, slender and scarcely expanding on 4, thence gradually widening to the distal end of 6 or even that of 7, beyond which it is considerably narrowed again. Pile pale brownish, long and thick on segs. 1 and 2, elsewhere very short. Genital lobes large, subangulate below, moderately incurved, with dense pile.

Colour greenish black, but little shining, marked with dull yellow as follows: Seg. 1, a large lateral spot. Seg. 2, a large antero-ventral and usually a postero-ventral spot on each side, narrowly separate or connected, the latter extending upon bases of auricles; a pair of large, rounded postero-dorsal spots, which may be narrowly connected with the postero-ventral spot, and a pale, apical annulus. Seg. 3, a pair of small, antero-dorsal spots and larger paler antero-ventral spots, continued caudad as narrow marginal streaks. The remaining segments have no pale markings except the brownish streaks along the tergal margins on the ventral surface.

The abdominal appendages (pl. X, figs. 4b, 4c) differ from those *forcipata* as follows: The superior appendages are less arched in profile with a less prominent distal ventro-lateral prominence; the lateral carina extends farther distad and gives a broken appearance to the outer margin in dorsal view, the apices are more acute. The inferior appendage is a little shorter. The broken outer margin and acute apices also distinguish the appendages from those of *incurvata* and *semicircularis*, the latter differing also in other points already noted.

Female.—Similar to male in coloration with the following slight differences: Abdominal segment 2 with a single large pair of ventro-lateral spots and a pair of postero-dorsals, or these may fuse to form one large lateral blotch. Seg. 3 with antero-dorsal spots much larger and broadly connected with the antero-ventral spots. The basal yellow spot of the hind wings may be very small or indistinct.

The shape of the abdomen varies much according to age, and is similar to that of *incurvata*. Vulvar lamina about four-fifths as long as 9th sternite, not elevated, spoon-shaped, broadest at

base, but little narrowed distad, the free margin entire, broadly rounded, colour yellowish.

VENATIONAL DETAILS. (10 ♂'s 10 ♀'s.)

	No. of veins	No. of wings, ♂	No. of wings, ♀		No. of veins	No. of wings, ♂	No. of wings, ♀
Antecubitals, fore wings.	7 8 9	11 =55% 9 =45%	11 =55% 8 =40% 1 =5 %	Antecubitals hind wings.	4 5 6 7 8	1 =5 % 17 =85% 1 =5 % 1 = 5%	 19 =95% 1 = 5%
Postcubitals, fore wings.	5 6 7 8	 12 =60% 4 =20% 4 =20%	6 =30% 6 =30% 8 =40%	Postcubitals, hind wings.	5 6 7 8 9 10	1 = 5% 1 = 5% 8 =40% 7 =35% 2 =10% 1 = 5%	2 =10% 2 =10% 12 =60% 3 =15% 1 = 5%
Triangles fore wings	0 1 2	20 =100%	20 =100%	Triangle hind wings	0 1 2	7 =35% 13 =65%	4 =20% 15 =75% 1 = 5%

Measurements.—10 ♂'s 10 ♀'s. Length (without apps.) ♂ 46.5–51.0, ♀ 46.0–52.0; thorax, ♂ 8.5–9.0, ♀ 7.0–8.0; abdomen (without apps.), ♂ 33–36, ♀ 34–38.5; hind wing, ♂ 30–31.5, ♀ 30–32.5 ; sup. apps. ♂ 3.6–4; apps. ♀ 3.4–4.3 ; pterostigma of hind wing, ♂ 2.5–3, ♀ 2.5–3; width of hind wing, ♂ 8.5–9, ♀ 9–10; width of head, ♂ 7–7.5, ♀ 7.25–7.6.

Holotype.—♂, Orono, Me., F. L. Harvey, collection of Dr. P. P. Calvert. *Allotype.*—♀, Orono, Me., F. L. Harvey, collection of Dr. P. P. Calvert ; taken in cop. with holotype. *Paratopotype.*—♂, June 15, 1891, Harvey, collection of Dr. Calvert.

I have also examined the following specimens: Orono, Me., June 18, 1898, Bartle Harvey, 1 ♀, (U. S. Nat. Mus.); Manchester, Me., Miss M. Wadsworth, June 20, 1904, 1 ♀, (coll. Calvert); Concord, Mass., R. H. Howe, June 18, 1917, 1 ♀, (teneral); id., June 24, 1917, 2 ♂'s 1 ♀ ; id., June 4, 1917, 1 ♀ ; id., June 4, 1918, 1 ♂ 1 ♀ ; id., June 6, 1918, 1 ♂ 1 ♀ ; id., June 9, 1918, 1 ♂; Manistiqua River, Schoolcraft Co., Mich., 2 ♂'s, (A. F. Combs); Godbout River, Quebec, July 29, 1918, 1 ♂ 1♀, (Walker); Mer Bleue, near Ottawa, Ont., June 9, 1903, 2 ♂'s 2 ♀'s, (A. Gibson); De Grassi Pt., Lake Simcoe, Ont., June 19, 1917, 1 ♂, (Walker). Total 13 ♂'s, 11 ♀'s.

This species has been confused with both *forcipata* and *semicircularis*. Eastern records of this latter species all belong to

kennedyi. The untangling of the synonymy, however, can be omitted here, as it will be considered in my revision of the genus, now in preparation.

I take pleasure in naming this species after Mr. Clarence Hamilton Kennedy in recognition of his valuable contributions to North American Odonatology. Mr. Kennedy recognized this species as distinct independently of the writer and at about the same time, so that it is particularly fitting that it should bear his name.

Somatochlora franklini Selys.

This species is remarkable for the great length and slenderness of the abdomen and shortness of the wings in the male, and to a less extent in the female. There is much variation in these characters, and also in size, coloration of wings and length of appendages of the ♀.

A study of this species in considerable series shows that *S. macrotona* Wmsn. (Ent. News, Feb., '09, pp. 78–79) is not distinct from *franklini*, the characters employed to separate the two forms being very variable, especially in the female. The principal character upon which the specific diagnosis of *macrotona* was based is the presence of small genital lobes in the ♀, these being absent in *franklini*. I find these lobes are sometimes present as an individual variation, but are independent of the other characters given for *macrotona*. They show various degrees of development, being sometimes barely indicated.

There is some doubt as to whether the present species is the true *franklini* of Selys. In case it proves to be a distinct species, the name *macrotona* will still be valid.

S. franklini is the most widely distributed species of this group, and is characteristic of the Hudsonian and Canadian zones from Labrador, Newfoundland and Maine to the Rocky Mountains, probably ranging to the Pacific Coast.

I have examined the following material: Hopedale, Labrador, Aug., 1917, 1 ♀, (W. W. Perrett); East Main, Hudson Bay, Que., July 8, 1914, 2 ♀'s, (W. Todd); Sherbrooke, Que., 1 ♀, (Abbè Begin); Mer Bleue, near Ottawa, Ont., June 9, 1908, 1 ♂, (A. Gibson); Western Ont., Hudson Bay drainage, July 21, 1917, (Mrs. G. K. Jennings), 1 ♀; Winnipeg, Man., June 16, 1910,

1 ♂ 1 ♀, (J. B. Wallis); Winnipeg Beach, Man., June 19, 1909, 1 ♀, (Wallis); Husavick, Man., Aug. 17, 1910, 1 ♀, (Wallis); Le Pas, Man., July 1, 1917, 1 ♂ 2 ♀'s, (Wallis); Hudson Bay Railway, various points from M214 to M332, July 7–19, 1917, 4 ♂'s 7 ♀'s, (Wallis); Nordegg, Alta., July 11–17, 1917, 5 ♂'s 17 ♀'s, (F. C. Whitehouse); Chemo Stream, Bradley, Me., July 27, 1891, 1 ♂, (F. L. Harvey); Whitefish Point, Chippewa Co., Mich., Aug. 4, 1916, 1 ♂; id., no date, 2 ♂'s, (A. F. Combs). Total 16 ♂'s, 34 ♀'s.

Explanation of Plate X.

Fig. 1—*Somatochlora semicircularis* Selys, ♂ (legs and wings omitted); 1a, front view of head; 2b, abdominal appendages of ♂, dorsal view; 1c, same, lateral view; 1d, end segments of ♀, lateral view; 1e, same, ventral view (appendages omitted).

Figs. 2—2e, *Somatochlora incurvata*, n. sp., same parts in fig. 1-1e.

Figs. 3—3e, *Somatochlora forcipata* Scudd., same parts as in figs. 1-1e.

Figs. 4—4e, *Somatochlora kennedyi*, n. sp., same parts as in figs. 1-1e.

Figs. 5—5e, *Somatochlora franklini* Selys, same parts as in figs. 1-1e.

ZOROTYPUS HUBBARDI, A NEW SPECIES OF THE ORDER ZORAPTERA FROM THE UNITED STATES.

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For over two decades a very unusual termitophilous inquiline has remained unstudied in the National Collection in spite of its having been several times brought to the attention of men better fitted to publish upon it than myself. It seems wrong to neglect longer the recording of this interesting addition to our fauna, and especially the interesting notes made by Mr. H. G. Hubbard, the original discoverer of the species, and I have, therefore, decided to assume the responsibility for the new name here erected. In